

## CLAIMS

1. A method for controlling an etching amount and an etching solution in spin etching, comprising:

5 (a) a first step of taking out one wafer from a loading cassette;

(b) a second step of measuring the weight  $W_1$  of the wafer before etching;

(c) a third step of calculating an etching time  $T_0$  with the following equation (1):

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$$T_0 = V_0 \div R \dots (1),$$

wherein  $T_0$  is an etching time (min),  $V_0$  is a target etching amount (g),  $R$  is an initial value  $R_0$  (g/min) of an etching rate of a starting etching solution to be used, an etching rate  $R_1$  (g/min) of the etching solution after etching or an etching rate  $R_2$  (g/min) of the etching solution into which an additional etching solution has been added.

15 (d) a fourth step of etching the wafer for the calculated time  $T_0$ ;

(e) a fifth step of measuring weight  $W_2$  of the wafer after etching;

(f) a sixth step of calculating an etching rate  $R_1$  of the etching solution after etching with the following equation (2):

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$$R_1 = (W_1 - W_2) \div T_0 \dots (2),$$

wherein  $R_1$  is an etching rate of an etching solution after etching,  $W_1$  is weight (g) of a wafer before etching,  $W_2$  is weight (g) of a wafer after etching and  $T_0$  is an etching time.

(g) a seventh step of accommodating the etched wafer; and

25 (h) an eighth step of determining whether or not an etching rate  $R_1$

of the etching solution after etching falls within an allowable range,

wherein when it is decided in the eighth step that an etching rate  $R_1$  falls within the allowable range, the process from the first step to the seventh step is performed on a wafer to be processed in the next order, or 5 when it is decided in the eighth step that an etching rate  $R_1$  falls outside the allowable range, there is performed a ninth step of adding an additional etching solution into the etching solution to restore the etching rate  $R_1$  to the etching rate  $R_2$  in the vicinity of the initial value  $R_0$ , and thereafter the process from the first step to the seventh step is performed on a wafer to be 10 processed in the next order.

2. A method for controlling an etching amount and an etching solution in spin etching, comprising:

(a) a first step of taking out one wafer from a loading cassette;  
 (b) a second step of measuring the weight  $W_1$  of the wafer before 15 etching;

(c) a third step of determining an etching amount  $V$  with the following equation (3):

$$V = W_1 - W_0 \dots (3),$$

wherein  $V$  indicates an etching amount (g),  $W_1$  is weight (g) of a 20 wafer before etching, and  $W_0$  is weight of a finished wafer, that is a target weight (g) of a wafer after etching;

(d) a fourth step of calculating an etching time  $T$  with the following equation (4):

$$T = V \div R \dots (4),$$

wherein  $T$  is an etching time (min),  $V$  is a target etching amount (g), 25

R is an initial value  $R_0$  (g/min) of an etching rate of a starting etching solution, an etching rate  $R_1$  (g/min) of the etching solution after etching or an etching rate  $R_2$  (g/min) of the etching solution into which an additional etching solution has been added;

- 5        (e) a fifth step of etching the wafer;
- (f) a six step of measuring weight  $W_2$  of the wafer after etching;
- (g) a seventh step of calculating an etching rate  $R_1$  of the etching solution after etching with the following equation (5):

$$R_1 = (W_1 - W_2) \div T \quad \dots(5),$$

10        wherein  $R_1$  is an etching rate (g/min) of the etching solution after etching,  $W_1$  is weight (g) of a wafer before etching,  $W_2$  is weight (g) of a wafer after etching and T is an etching time,

- (h) an eighth step of accommodating the etched wafer; and
- (i) a ninth step of determining whether or not an etching rate  $R_1$  of

15        the etching solution after etching falls within an allowable range;

          wherein when it is decided in the ninth step that an etching rate  $R_1$  falls within the allowable range, the process from the first step to the seventh step is performed on a wafer to be processed in the next order, or when it is decided in the ninth step that an etching rate  $R_1$  falls outside the 20 allowable range, there is performed a tenth step of adding an additional etching solution into the etching solution to restore the etching rate  $R_1$  to the etching rate  $R_2$  in the vicinity of the initial value  $R_0$ , and thereafter the process from the first step to the eighth step is performed on a wafer to be processed in the next order.

25        3.        The method according to claim 1 or 2, wherein confirmation

treatment is performed for the initial value  $R_0$  of the etching rate of the starting etching solution and/or the etching rate  $R_2$  of the etching solution which has been restored to a value in the vicinity of the initial value by adding an additional etching solution into the used etching solution.

5 4. The method according to claim 3, wherein the confirmation treatment for the etching rate comprises:

(a) a first step of taking out one wafer from a dummy wafer holding table;

10 (b) a second step of measuring weight  $D_1$  of the dummy wafer before etching;

(c) a third step of etching the dummy wafer for a given time  $t_0$ ;

(d) a fourth step of measuring weight  $D_2$  of the dummy wafer after etching;

15 (e) a fifth step of calculating an etching rate  $r_0$  of the etching solution after etching with the following equation (6):

$$r_0 = (D_1 - D_2) \div t_0 \quad \dots(6),$$

wherein  $r_0$  is an etching rate (g/min) of the etching solution after etching,  $D_1$  is weight (g) of the dummy wafer before etching,  $D_2$  is weight (g) of the dummy wafer after etching, and  $t_0$  is an etching time;

20 (g) a seventh step of transferring the etched dummy wafer to the dummy wafer holding table; and

(h) an eighth step of determining whether or not weight of the etched dummy wafer falls within a defined range;

25 wherein when it is decided in the eighth step that weight of the dummy wafer falls within the defined range, the confirmation treatment for

the etching rate is terminated, or when it is decided in the eighth step that the weight of the dummy wafer falls outside the defined range, there is performed a ninth step of generating an exchange request signal for the used dummy wafer, and thereafter the confirmation treatment for the 5 etching rate is terminated.

5. A spin etching apparatus comprising: a spin etching section for etching a wafer; an etching solution circulating tank for storing and circulating the etching solution; an etching solution feed line for feeding the etching solution from the etching solution circulating tank to the spin 10 etching section; an etching solution recovering line for recovering the etching solution used in the spin etching section into the etching solution circulating tank; a weight measuring section for measuring weight before and after etching of the wafer etched in the spin etching section; and a handling mechanism section in which the wafer to be etched is transferred 15 to the weight measuring section, and after the weight of the wafer is measured, the wafer is transferred to the spin etching section, the etched wafer is transferred to the weight measuring section from the spin etching section, and after the weight of the etched wafer is measured, the wafer is taken out from the weight measuring section.